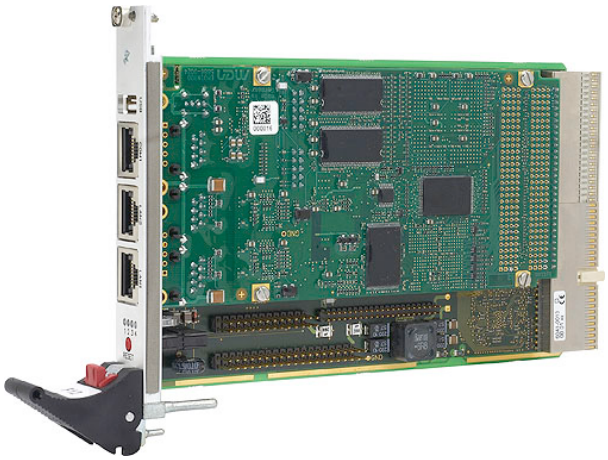
Embedded Solutions

F12N - 3U CompactPCI® PowerPC® MPC5200B CPU Board



- **32-bit/33-MHz cPCI system slot, 4 HP**
- **MPC5200B / 384 MHz**
- **FPGA 18,752 LEs (approx. 225,000 gates)**
- **Up to 256 MB onboard DDR SDRAM**
- **Up to 8 MB boot Flash, NAND Flash**
- **2 MB SRAM, 16 MB graphics memory**
- **Dual Fast Ethernet, COM, USB (front)**
- **Dual CAN bus controller**
- **FPGA for user-defined I/O functions**
- **MENMON™ BIOS for PowerPC® cards**
- **-40 to +85°C with qualified components**

Equipped with the MPC5200B PowerPC®, the F12N single-board computer is a versatile 3U Eurocard CompactPCI® board that operates at up to 400 MHz and 700 MIPS. The F12N is designed especially for systems which require low power consumption and mechanical robustness. With the processor consuming less than 1 W, the board is delivered for -40 to +85°C operation temperature. All components on the board are soldered. The F12N is thus well placed as a rugged computing platform for mobile applications, offering the whole world of Linux based software and real-time operating support for VxWorks® and QNX®.

The CPU card is equipped with an onboard soldered SDRAM of up to 256 MB and up to 1 GB NAND Flash as well as with 16 MB additional SDRAM, up to 8 MB boot Flash and 2 MB battery-backed SRAM.

The SBC provides two Fast Ethernet interfaces, one serial line and USB 1.1 at its front panel. As an alternative to RJ45, D-Sub connectors guarantee reliable functions also in harsh environments. Two CAN controllers with V2.0A/B CAN protocol are included in the MPC5200B and are accessible via SA-Adapters™. A second serial interface can be accessed using an SA-Adapter™ on the F12N. (E)IDE and GPIO are also on board.

The large FPGA on the F12N allows to realize additional user-defined functions such as graphics, touch, further serial interfaces, further CAN bus controllers, binary I/O etc. for the needs of the individual application in a very flexible way. Before boot-up of the system, the FPGA is loaded from boot Flash. Updates of the FPGA contents can be made inside the boot Flash during operation. The FPGA functions can be physically implemented by using SA-Adapters™. A maximum of 8 SA-Adapters™ can be used on the F12N and I/O can be made accessible at the front panel.

Equipped with a PCI-bridge chip, the F12N offers a full CompactPCI® interface (system slot functionality) for reliable system expansion.

The F12N comes with MENMON™ support. This firmware/BIOS can be used for bootstrapping operating systems (from disk, Flash or network), for hardware testing, or for debugging applications without running any operating system.

mikro elektronik
gmbh • nürnberg

Embedded Solutions

Technical Data

CPU
- PowerPC®
  - MPC5200B
  - Up to 400MHz

Memory
- 2x16KB L1 data and instruction cache integrated in MPC5200
- Up to 256MB SDRAM system memory
  - Soldered
  - DDR
  - 64MHz memory bus frequency
- Up to 1GB soldered NAND Flash (and more), FPGA-controlled
- 16MB additional SDRAM, FPGA-controlled, e.g. for video data and NAND Flash firmware
- Up to 8MB boot Flash
- 2MB GoldCap-backed SRAM, or: 128KB non-volatile FRAM
- Serial EEPROM 8kbits for factory settings

Mass Storage
- Parallel IDE (PATA)
  - One IDE port via 44-pin onboard connector
  - FPGA-controlled
  - PIO mode 0 support
- Up to 1GB soldered ATA NAND Flash (and more), FPGA-controlled

I/O
- USB
  - One USB 1.1 port
  - Series A connector at front panel
  - OHCI implementation
  - Data rates up to 12Mbit/s
- Ethernet
  - Two 10/100Base-T Ethernet channels
  - One channel FPGA-controlled
  - Two RJ45 or one D-Sub connector at front panel
- One RS232 UART (COM1)
  - RJ45 or D-Sub connector at front panel
  - Data rates up to 115.2kbit/s
  - 512-byte transmit/receive buffer
  - Handshake lines: CTS, RTS
- One UART (COM10)
  - Accessible via I/O connector
  - Physical interface at front panel using SA-Adapter™ via 10-pin ribbon cable on I/O connector
  - RS232..RS485, isolated or not: for free use in system (e. g. cable to front)
  - Data rates up to 115.2kbit/s
  - 16-byte transmit/receive buffer
  - Handshake lines: CTS, RTS; DCD, DSR, DTR; RI
- CAN bus
  - Two CAN bus channels
  - 2.0 A/B CAN protocol
  - Data rates up to 1 Mbit/s
  - Connection via onboard connectors
  - External transceivers using SA-Adapters™
- GPIO
  - 36 GPIO lines
  - FPGA-controlled
  - Connection via onboard I/O connector
- Further I/O depending on FPGA configuration

Front Connections (Standard)
- One USB 1.1 (Series A)
- Two Ethernet (RJ45)
- One RS232 UART (RJ45)

FPGA
- Standard factory FPGA configuration:
  - Main bus interface
  - 16Z070_IDEDISK - IDE controller for NAND Flash
  - 16Z043_SDRAM - Additional SDRAM controller (16MB)
  - 16Z023_IDENHS - IDE controller (PIO mode 0; non-hot-swap)
  - 16Z087_ETH - Ethernet controller (10/100Base-T)
  - 16Z025_UART - UART controller (controls COM10)
  - 16Z034_GPIO - GPIO controller (40 lines, 5 IP cores)
- The FPGA offers the possibility to add customized I/O functionality. See FPGA.

Miscellaneous
- Real-time clock with GoldCap backup
- Power supervision and watchdog
- Reset button, GPIO-controlled
- Three user LEDs, GPIO-controlled; 1 FPGA power status LED

CompactPCI® Bus
- Compliance with CompactPCI® Core Specification PICMG 2.0 R3.0
- System slot
- 32-bit/32-MHz PCI-to-PCI bridge
- V(I/O): +3.3V or +5V (Universal Board)

Electrical Specifications
- Supply voltage/power consumption, CompactPCI® standard version:
  - +5V (-3%/+5%), 10mA max.
  - +3.3V (-3%/+5%), 1A typ.
- Supply voltage/power consumption, stand-alone version:
  - +5V (-3%/+5%), 800mA typ.
  - Uses 5V only
- MTBF: 277,234h @ 40°C according to IEC/TR 62380 (RDF 2000)

mikro elektronik gmbh • nürnberg

Embedded Solutions

Technical Data

Mechanical Specifications
- Dimensions: conforming to CompactPCI® specification for 3U boards
- Weight: 250g

Environmental Specifications
- Temperature range (operation):
  - -40..+85°C (qualified components)
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz
- Conformal coating on request

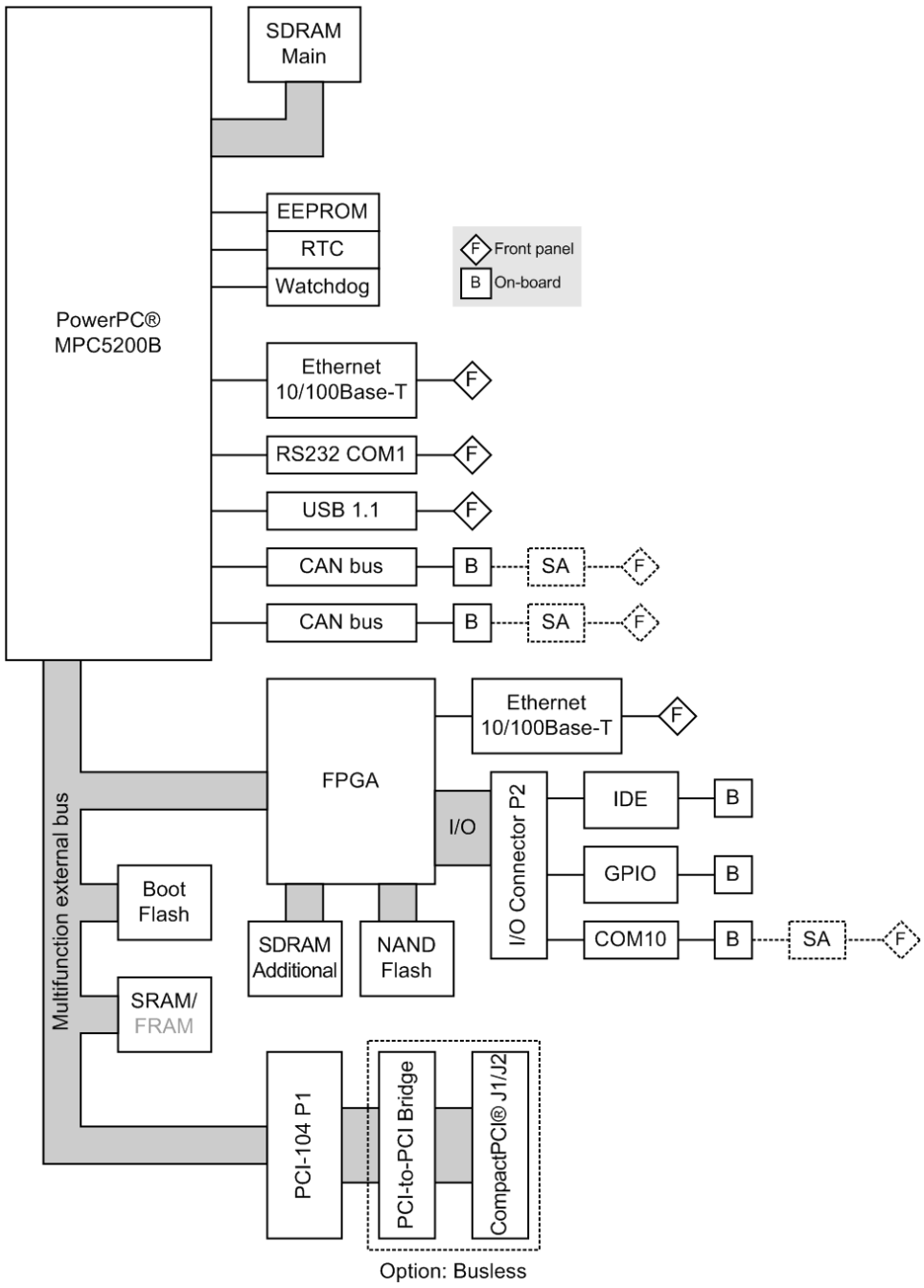
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst)

BIOS
- MENMON™

Software Support
- VxWorks®
- Linux (ELinOS)
- QNX®
- MSCAN/Layer2 support: MEN Driver Interface System (MDIS™ for all supported operating systems)
- For more information on supported operating system versions and drivers see Software.

Diagram


SDRAM Main
EEPROM
RTC
Watchdog
F Front panel
B On-board
PowerPC®
MPC5200B
Ethernet 10/100Base-T
F
RS232 COM1
F
USB 1.1
F
CAN bus
B
SA
F
CAN bus
B
SA
F
Ethernet 10/100Base-T
F
FPGA
I/O
I/O Connector P2
IDE
B
GPIO
B
COM10
B
SA
F
Multifunction external bus
Boot Flash
SRAM/ FRAM
SDRAM Additional
NAND Flash
PCI-104 P1
PCI-to-PCI Bridge
CompactPCI® J1/J2
Option: Busless

Configuration & Options

Standard Configurations

Article No.	CPU Type	Clock	System RAM	NAND Flash	Boot Flash	Additional SDRAM	SRAM
02F012N00	MPC5200B	384 MHz	256 MB	1 GB	2 MB	16 MB	2 MB

Options

CPU

- MPC5200B, 384 MHz

Memory

- System RAM
  - 32 MB, 64 MB, 128 MB or 256 MB
- NAND Flash
  - 0 MB up to maximum available
- Boot Flash
  - 2 MB, 4 MB or 8 MB
- Additional SDRAM
  - 0 MB or 16 MB
- SRAM
  - 0 MB or 2 MB
- 128 KB non-volatile FRAM instead of SRAM

I/O

- Up to 8 additional I/O functions through SA-Adapters™
  - Mostly implemented in onboard FPGA
  - RS232, RS422/485, binary I/O, keyboard/mouse, CAN...
  - One-piece 3U front panels for different SA-Adapter™ combinations
- Front connections
  - D-Sub connectors for Ethernet and COM/USB
- Second Ethernet channel at front through FPGA

Busless

- Also available as busless version (with external 5V supply)

Cooling Concept

- Also available with conduction cooling in MEN CCA frame

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

FPGA

Flexible Configuration

- Customized I/O functions can be added to the FPGA.
- It depends on the board type, pin counts and number of logic elements which IP cores make sense and/or can be implemented. Please contact MEN for information on feasibility.
- You can find more information on our web page "User I/O in FPGA"

FPGA Capabilities

- FPGA Altera® Cyclone® II EP2C20
  - 18,752 logic elements
  - 239,616 total RAM bits
- Connection
  - Available pin count: 47 pins
  - Functions available via onboard I/O connector
  - SA-Adapters™ can be used to realize the physical lines.

Embedded Solutions

Ordering Information

Standard F12N Models

02F012N00 MPC5200B/384MHz, 256MB SDRAM, 1GB NAND Flash, 2MB SRAM, 16MB additional SDRAM, 2MB boot Flash, -40..+85°C qualified

SA-Adapters

You can find a more detailed overview of possible carrier board/SA-Adapter™ combinations along with software support in our option matrix (PDF).

08SA01-00 RS232, not optically isolated, 0..+60°C

08SA02-00 RS422/485, half duplex, optically isolated, 0..+60°C

08SA02-07 RS422/485, full duplex, optically isolated, -40..+85°C screened

08SA03-01 RS232, optically isolated, -40..+85°C screened

08SA08-01 CAN ISO high-speed, optically isolated, -40..+85°C screened

Systems & Card Cages

MEN delivers turn-key systems completely installed (hardware, operating system, accessories), wired and tested. Different rack sizes, power supplies and backplanes on request.For details please contact your local sales representative.

0701-0046 CompactPCI® 19" 4U/24HP desktop system for 3U cards, 3-slot 3U CompactPCI® backplane, system slot right, 1U fan tray with 1 fan, 8 HP space for 1 pluggable PSU

0701-0056 CompactPCI® 19" 4U/84HP rack-mount enclosure for 3U cards (vertical), 4+4-slot 3U CompactPCI® / CompactPCI® Serial hybrid backplane, prepared for rear I/O, 250W power supply wide range 90..264VAC on rear, 1U fan tray with 2 fans included, 0..+60°C

Miscellaneous Accessories

05F006-00 RS232 interface cable RJ45 to 9-pin D-Sub (1 COM to 1 COM), 2m

05F500-00 Kit (cables and front panel for 3 D-Subs) for connection of 2 CAN (type SA8) and 1 COM (type SA1..SA4) to F12N - SA-Adapters™ to be ordered separately

Software: Linux

This product is designed to work under Linux. See below for potentially available separate software packages from MEN.

10EM01-90 Linux BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12, F12N and PP1 under ELinOS 5.0 (rpm for direct installation in ELinOS)

This product is designed to work under ELinOS Embedded Linux by Sysgo. For more information and product support please contact www.sysgo.com.

13Z015-06 MDIS5™ low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)

13Z017-06 MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO and 16Z037_GPIO

13Z025-90 Linux native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART

13Z077-90 Linux native driver (MEN) for 16Z077_ETH and 16Z087_ETH

Software: VxWorks

This product is designed to work under VxWorks®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets.

10EM01-60 VxWorks® BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12N and F12

13Z015-06 MDIS5™ low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)

13Z017-06 MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO and 16Z037_GPIO

13Z025-60 VxWorks® native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART

Software: QNX

This product is designed to work under QNX®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets.

10EM01-40 QNX® 6.3 SP3 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N

10EM01-41 QNX® 6.4.1 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N

10EM01-42 QNX® 6.5.0 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N

13Z015-06 MDIS5™ low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)

13Z017-06 MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO and 16Z037_GPIO

13Z025-40 QNX® 6.3 native driver (MEN) for 16Z025_UART and 16Z125_UART

13Z025-41 QNX® 6.4 native driver (MEN) for 16Z025_UART and 16Z125_UART

13Z025-42 QNX® 6.5 native driver (MEN) for 16Z025_UART and 16Z125_UART

mikro elektronik
gmbh • nürnberg

Ordering Information

13Z087-40	QNX® native driver (MEN) for 16Z087_ETH

Software: Firmware/BIOS

MENMON™ is MEN's firmware/BIOS for PowerPC® platforms.

14EM01-00	MENMON™ (Firmware) for EM1, EM1A, EM1N, F12 and F12N (object code)

For operating systems not mentioned here contact MEN sales.

Documentation

Compare Chart 3U CompactPCI® / PlusIO CPU cards Download

Compare Chart 3U CompactPCI® / PlusIO peripheral cards Download

20F012NER	F12N Errata
20F012N00	F12N User Manual
21MENM-00	MENMON™ User Manual
21Z025-90	16Z025_UART and 16Z125_UART under Linux User Manual
22Z025-ER	16Z025_UART Errata
22Z087-ER	16Z087_ETH Errata

For the most up-to-date ordering information and direct links to other data sheets and downloads, see the F12N online data sheet under » www.men.de.

Embedded Solutions

Contact Information

Germany
MEN Mikro Elektronik GmbH
Neuwieder Straße 3-7
90411 Nuremberg
Phone +49-911-99 33 5-0
Fax +49-911-99 33 5-901
E-mail info@men.de
www.men.de

France
MEN Mikro Elektronik SA
18, rue René Cassin
ZA de la Châtelaine
74240 Gaillard
Phone +33 (0) 450-955-312
Fax +33 (0) 450-955-211
E-mail info@men-france.fr
www.men-france.fr

USA
MEN Micro, Inc.
24 North Main Street
Ambler, PA 19002
Phone (215) 542-9575
Fax (215) 542-9577
E-mail sales@menmicro.com
www.menmicro.com

The date of issue stated in this data sheet refers to the Technical Data only. Changes in ordering information given herein do not affect the date of issue.
All brand or product names are trademarks or registered trademarks of their respective holders.
MEN is not responsible for the results of any actions taken on the basis of information in the publication, nor for any error in or omission from the publication.
MEN expressly disclaims all and any liability and responsibility to any person, whether a reader of the publication or not, in respect of anything, and of the consequences of anything, done or omitted to be done by any such person in reliance, whether wholly or partially, on the whole or any part of the contents of the publication.
The correct function of MEN products in mission-critical and life-critical applications is limited to the environmental specification given for each product in the technical user manual.The correct function of MEN products under extended environmental conditions is limited to the individual requirement specification and subsequent validation documents for each product for the applicable use case and has to be agreed upon in writing by MEN and the customer.Should the customer purchase or use MEN products for any unintended or unauthorized application, the customer shall indemnify and hold MEN and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim or personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that MEN was negligent regarding the design or manufacture of the part.
In no case is MEN liable for the correct function of the technical installation where MEN products are a part of.

Copyright © 2012 MEN Mikro Elektronik GmbH. All rights reserved.

mikro elektronik
gmbh • nürnberg